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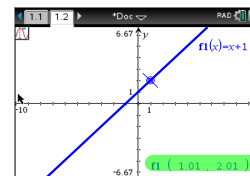
## 2.1a Limits

Write a sentence to explain the meaning of the following expression to someone who has not had calculus:  $\lim_{h \rightarrow 0} 4 + h = 4$

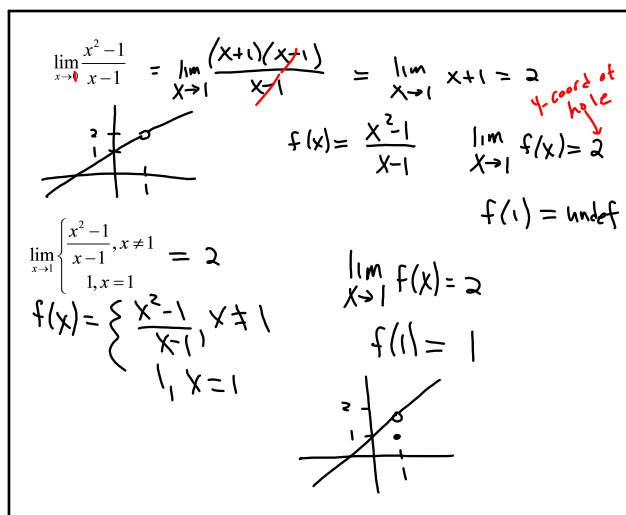
as  $h$  gets closer and closer to 0  
 $4+h$  gets closer to 4

Estimate the following limits using graphical, numerical and symbolic methods:

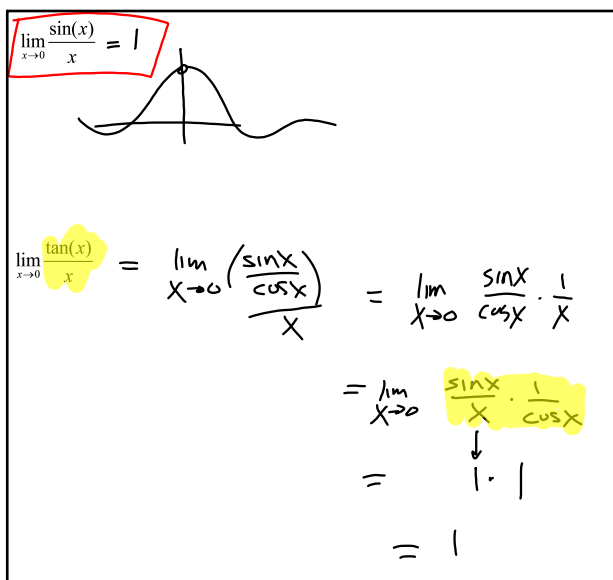
$$\lim_{x \rightarrow 1} (x+1) = 2$$



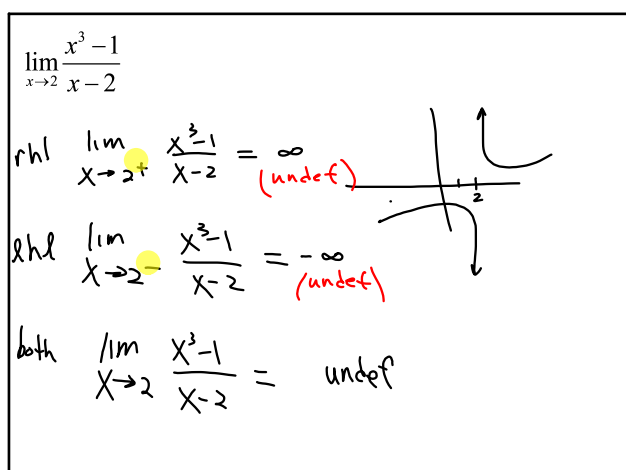
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## One-sided limits

$$\lim_{x \rightarrow c^+} f(x)$$

$$\lim_{x \rightarrow c^-} f(x)$$

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Example 8

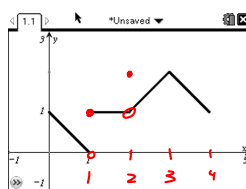
$$\lim_{x \rightarrow 1^+} f(x) = 1$$

$$\lim_{x \rightarrow 1^-} f(x) = 0$$

$$\lim_{x \rightarrow 1} f(x) = \text{undef.}$$

because  $\text{lhs} \neq \text{rhs}$ 

$$f(1) = 1$$



$$\lim_{x \rightarrow 2^+} f(x) = 1$$

$$\lim_{x \rightarrow 2^-} f(x) = 1$$

$$\lim_{x \rightarrow 2} f(x) = 1$$

$$f(2) = 2$$

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